User Manual Rheomat R 123

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1 Introduction

The Rheomat R 123 serves to determine dynamic viscosity of liquids.

The Rheomat R 123 is a very easy to handle instrument. This rotation type viscometer was reduced to the most important functions and can therefore fastly be employed at any place.

2 Measurement Principle

The Rheomat R 123 is a rotation type viscometer. This means the measuring bob rotates in the product to be measured. The power that is needed to have the measuring bob rotating with a predetermined speed in the sample is measured. Viscosity is calculated from this torque, the rotational speed of the measuring bob and the measurement system geometrics.

Viscosity measurement with the Rheomat R 123 bases on the SEARLE-Principle: rotation type rheometer with fixed measuring cup and rotating measuring bob.

Fig. 1

The Rheomat R 123 measuring bob rotates with a constant speed (n = 62,5 min^{-1}) in a sample. The necessary torque to have the measuring bob rotating with this constant rotational speed is a direct value for the viscosity of the sample.

3 Start-up procedure

3.1 Location

The Rheomat R 123 must be used vertically. Therefore the according stand is suitable. For laboratory use the Rheomat R 123 and its stand (optional accessory) should be positioned on a level bench. The proRheo R 123 may be operated at ambient temperature between + 10 and + 40 °C only.

3.2 Installation

3.2.1 Front view

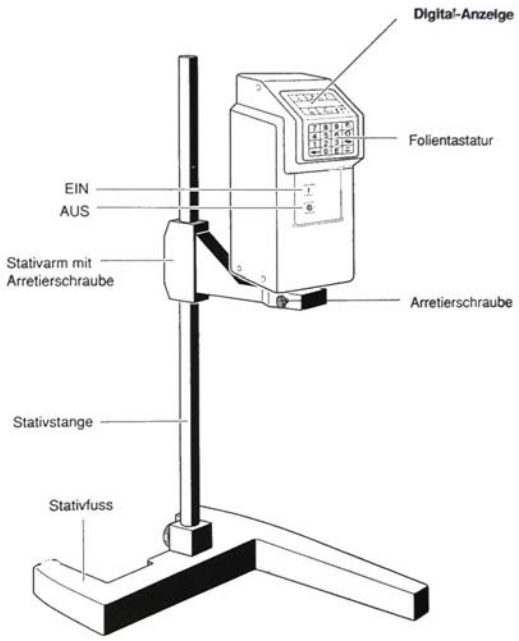


Fig. 2

If stand is used:

- Place stand rod in stand base and fix with the screw.
- Slide stand arm unit over stand rod and fix with the screw
- Install the Rheomat R 123 and fix with the screw

3.2.2 Side view

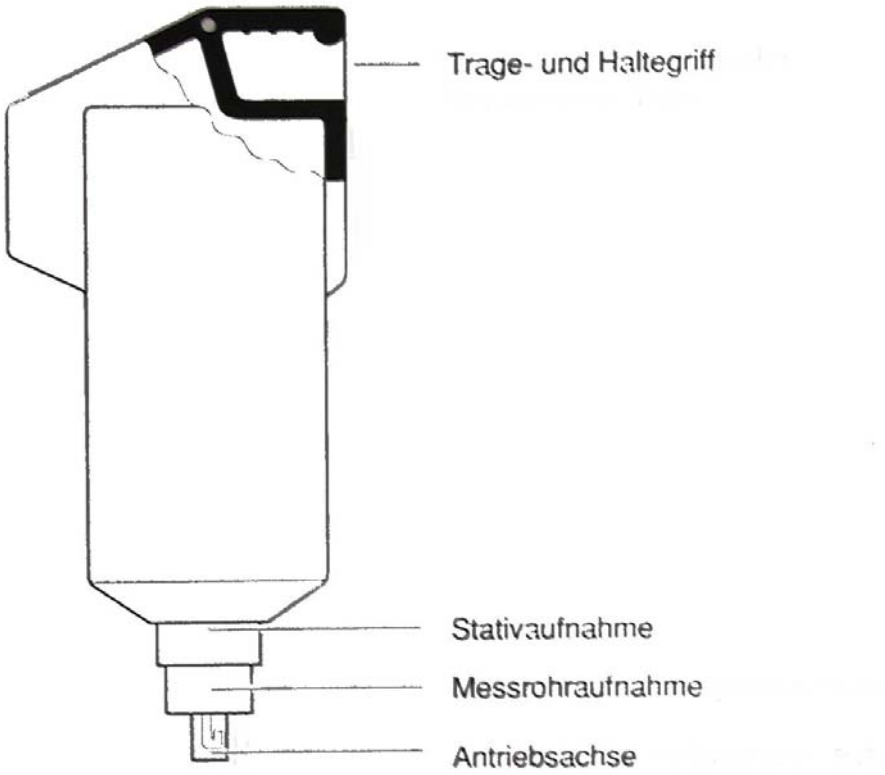


Fig. 3

- Connect the measuring bob needed for the first measurement to the drive axis.
- If old measuring bobs are used fix adapter.

  Note: The higher the viscosity of the test sample, the smaller the measuring bob used.

- Switch on the instrument. The display must show: proRheo R 123

4 The keypad

Keys	Function
Numbers	Entry of numeric values
E	Confirmation of an entry
0 (Zero)	Zero adjustment Simultaneously press this key when switching on: the display shows...› 0 ‹…
•	• Select language (see chapter 5.1) Simultaneously press this key when switching on: the display shows LANGUAGE. • Start measurement: when PRORHEO R123 is shown on the display.

According to the operation modus of the Rheomat R 123 the keys have different effects. Please see the following overview:

Keys	Entry	Function During operation	Together with ON (I)
0 ….. 9	Numbers		
E	Confirm		
0 (Zero)	Number		Automatic zero adjustment
←	Delete	Terminates single point measurement Confirmation that the measuring result was read.	
•	• (Point)	Start measurement	Select language: e = 0, d = 1, f = 2, it = 3, sp = 4, hl = 5

5 Settings

5.1 Language

When you switch on the Rheomat R 123 for the first time, the display is in English. For your daily work you can choose between 6 operation languages. Exceptions are the words LANGUAGE and TRY AGAIN.

- Press the point key and switch on the instrument simultaneously:
  LANGUAGE*:* appears on the display.
  Enter one of the following numbers for your language:

▪	0	English	▪	1	Deutsch
▪	2	Francais	▪	3	Italiano
▪	4	Espanol	▪	5	Nederlands

- Press the E key to confirm the entry.

Your language is stored by the proRheo R 123 until you define a different one.

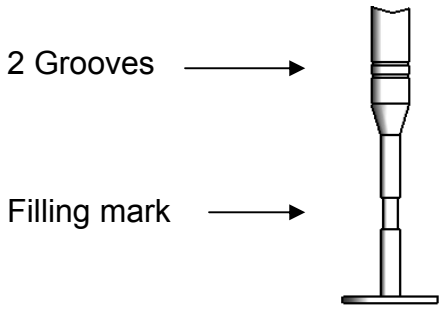
5.2 Measurement systems

The Rheomat R 123 can be operated with 3 different measuring systems. These are:

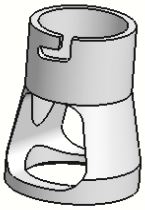
Bob No.1 No. 2 No. 3

According to their measuring system number the bobs are marked with one, two or three grooves.

For example bob no. 2:



The measuring bobs are to be used with their original measuring cup. Especially with measuring bob 3 it has to be taken into account that the measuring cup is in centric position. Here fore a coupling piece is used. It eases the measurement and guarantees measurement accuracy.



The original measuring bobs come with a coupling matching with the bayonet of the driving axis. In addition an adapter is delivered which allows using the old measuring systems of VT 02.

Note: If the adapter is used it must be taken out and properly cleaned minimum once a week.

6 Measurements

6.1 Preparation

The measuring cup must be filled very carefully.

Air bubbles in the sample have an effect on the measurement result. The stirring up and filling in of the sample corresponds to a pre-shearing and might influence the result. An adapted time of rest before measuring can have positive effects but for example the possibility of sedimentation has to be kept in mind.

6.1.1 Thermostating

As the viscosity of a sample usually depends on the temperature, we recommend to temperate the sample.

6.1.2 Zero adjustment

A zero adjustment should be done befor the first measurement and after each change of measuring system.

Connect the desired measuring bob
Attention: the measuring bob may not yet be dipped into the sample!

- Press the key 0 (zero) and simultaneously switch on the proRheo R 123.
  As long as the instrument executes the zero adjustment, the display shows
  ...> 0 <...
  Then the following display appears: proRheo R 123

Note: a. Do not touch the measurement bob while performing the zero adjustment.
b. The zero adjustment is stored.
c. Whenever possible, you should perform the zero adjustment after the instrument has warmed up. Allow the proRheo R 123 to run one measurement before you start the zero adjustment.

6.2 Measurement

Viscosity of a sample is determined at a constant shear rate.

- Fill the measuring cup
- Connect desired measuring bob no. 1, 2 or 3.
- Put on the centring part. Assure that the measuring bob is up to the mark in the sample (see chapter 5.2 Measuring systems)
- Switch on the Rheomat R 123 and wait until the display shows „proRheo R 123“
- Press the „Point“-key.
- Enter measuring system number and / or confirm with **E.**

Note: The measuring system number will be kept stored. For the following measurement you can either confirm the stored number wit **E** or enter a new measuring system number.

The measurement starts. The following values are shown constantly on the display during measurement:

- Torque M mNm
- Calculated viscosity η mPas (rounded on 50 mPas)
- Measurement system no., e.g. 1

Rheomat 123 takes several values per second and forms an average value which is shown. During measurement time of 30 s values can be read continuously.

After 30 s the measurement is finished. The measuring bob stops and the result can be read on the display.

Please confirm with the „arrow“-key. Now the next measurement can be started.
Note: Rheomat R 123 can measure between 0,25 and 10 mNm.
If the torque is too high please choose a smaller measuring bob.
If the torque is too low please choose a bigger measuring bob.

6.2.1 Termination of measurements

To terminate a single point measurement, either
- press the arrow key or
- Switch off the instrument.

7 Appendix

7.1 Using remarks

If the instrument is opened any claims on service or warranty expire. At an opened and net connected instrument risks to life and limb of the user may occur. Sensible parts or components under voltage are not specially marked.

At no time liquids may enter the Rheomat R 123. This can happen e.g. if the instrument is turned upside down for cleaning purposes. The user has to take care that this does not occur.

If a liquid cryostat or similar instrument is used no steam may enter the Rheomat R 123. This may cause trouble. The user has to take care that this does not occur.

The Rheomat R 123 may not be dipped into any liquid deeper than to the lower edge of the measuring bob holder. The user has to take care that this does not occur.

7.2 Maintenance

Warning: The Rheomat R 123 and the power supply may be opened by qualified service engineers only!

Opening the Rheomat R 123 or the power supply any warranty or service claims expire! At an opened and power connected instrument a risk to life and limb for the user may occur. Sensible parts or components under voltage are not specially marked.

7.2.1 Cleaning

- If the measuring head, drive shaft coupling or stand are really dirty or badly contaminated, clean only with a cloth moistened with soapy water, gasoline or alcohol.
- To clean the measuring bob and measuring tube, always uncouple these from the proRheo R 123!
- You can use appropriate solvents for the measurement systems.
- Measuring bob or adapter must be taken off the bayonet coupling at least once a week for cleaning.
- At no time liquids may enter the Rheomat R 123. This can happen e.g. if the instrument is turned upside down for cleaning purposes. The user has to take care that this does not occur.

7.2.2 Calibration and testing

The proRheo R 123 can be calibrated only by proRheo service. Special instruments and specialized knowledge are required.

For service and calibration proRheo offers service contracts. A form for ordering a service- or calibration contract is attached to this user manual.

To test whether the instrument needs a calibration, you can use calibration oils for viscosity measurements.

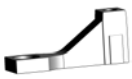
Glycerine (hygroscopic) and water (viscosity too low) are not suitable for testing purposes.

7.3 Errors and malfunctions

Error/ malfunction	Reason	Action
Torque too high	Viscosity of the sample is too high for the used measuring system	Use smaller measurement bob
Torque too low	Consistence of the sample is too liquid for the used measuring system	Use bigger measurement bob
Try again	Unreasonable input, e.g. measuring system no. 5	See user manual for possible entries in this dialog with R 123 are possible.
The green lamp of the power supply unit does not light up	Not attached to power supply or power supply defective	Check power supply
The display shows › READY	- The entries are wrong or not stored correctly Internal buffer battery is discharged	Switch off the R 123 and simultaneously press the point key. Reselect or re-enter language and code. Call ProRheo service
Rheomat R 123 switches itself off.	- Power supply unit disconnected from power supply - Torque too high (with single point measurement)	Attach to the power supply On restart, select a smaller measurement system

7.3.1 Accessories and Order numbers

Standard delivery includes measuring head, power supply and adapter

Illustration	Description	Order no.
	Rheomat R 123	200 0110
	Adapter for VT02- Measuring systems	401 0113
	Measurement bob 1	200 0191
	Measurement bob 2	200 0192
	Measurement bob 3	200 0193
	Measurement cup	200 0210
	Centring part for measuring cup	200 0300
	Stand	400 0200
	Stand arm	400 0215
	Case with set of measuring systems including: - 3 pieces measuring bob 1 - 3 pieces measuring bob 2 - 3 pieces measuring bob 3 - 1 centring part - 1 measuring cup - case	400 0215

7.4 Technical data

7.4.1 Measurement head R 123

Measurement principle	Rotational viscometer
Rotational speed	
• Range	62,5 min^{-1}
• Accuracy :	± 0,5% from stored rated value
Torque range	0,25 to 10,0 mN·m
Admissible ambient temperature	+10 to +40 °C
Data memory	Lithium battery, lifetime min. 3 years
Dimensions (measuring instrument)	
• Width x depth x height	105 x 135 x 350 mm
• Weight	2,2 kg
Power supply unit	
• Voltage/Current	100 - 120 V±10% / approx. 320 mA and 220 - 240 V±10% / approx. 160 mA
• Frequency	50 - 60 Hz
• Type of protection	I
• Approvals	Europe EN 60950 Electrical safety EN 55022 Interference suppression Canada CSA 22.2 No. 151-M1986

7.4.2 Measurement systems

System no.	Min. Viscosity [mPas]	Max. Viscosity [mPas]
1	300	10 000
2	7 500	300 000
3	30	1 000

7.5 Order form for Support / Service

Please fill in the required data and return this form by fax to the following no.:
+49 - 7051 – 92489- 29

Company
_____

Contact
_____

Department
_____

Telephone
_____

Fax
_____

email
_____

Address
_____

Address
_____

Please contact us because of the Rheomat R 123

Serial Number _____

Please give us information about:

- ☐ Maintenance Contract
- ☐ Service / Calibration
- ☐ Technical Inquiry